Patent Remedies

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The patent system is a fundamental part of how we reward invention. Patents are commonly viewed as the award of a monopoly: if you invent something new and useful, you can obtain a patent that gives you the exclusive right to practice your invention.

In reality, however, if you obtain a patent, what you *actually* get is the legal right to sue for patent infringement and then ask the court to impose "remedies" if you win. *Patent remedies* are central to the patent system and its economic effects. What are these remedies?

The remedy for *prior infringement*, i.e., infringement that has already taken place by the time the court rules, is fairly straightforward, at least in principle. The patent holder is entitled to *patent damages* which are primarily intended to compensate the patent holder for any harm caused by the infringement.

Historically, the *prospective remedy* for patent infringement was even more straightforward: the court would issue a permanent injunction ordering the infringer to stop infringing. But the Supreme Court dramatically changed the law regarding prospective patent remedies ten years ago in the *eBay* case. In that case, a unanimous Supreme Court stated:

> "According to well-established principles of equity, a plaintiff seeking a permanent injunction must satisfy a four-factor test before a court may grant such relief. A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction." *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 390 (2006)

As a result of the Supreme Court's decision in *eBay*, the patent remedy system in the United States is now a hybrid system, a mixture of property rules and liability rules. A patent holder who satisfies the *eBay* test can obtain a permanent injunction and benefit from a property rule: the infringer is ordered by the court to cease its infringing activities. In contrast, a patent holder who cannot satisfy the *eBay* test obtains the lesser protection of a liability rule: the infringer can continue its infringing activities so long as it pays the ongoing royalties established by the court.

I. The Nature of Patent Infringement

What narrative comes to mind when you think of patent infringement? Perhaps you

think of "guilty infringement," where someone copies the patented product and captures market share from the patent holder. Certainly some cases fit this pattern. But far more common is "innocent infringement," where a company develops a product on its own and is later judged to infringe a patent. The vast majority of patent infringers did not copy the patented invention from the patentee. Cotropia and Lemley (2009) find that copying was alleged in about 10% of litigated patent cases and found in less than 2% of those cases.

When one firm independently develops a product that is later found to infringe another firm's patent, Shapiro (2006) and Vermont (2006) argue that the first firm should be able to invoke an "independent invention defense" to shield itself entirely from liability for patent infringement. Patent law provides no such defense, but these authors argue that requiring independent inventors to compensate patent holders for the harm caused by their infringing activity tends to over-reward patent holders at the expense of other innovators. Rather than viewing independent inventors as "injuring" the patent holder, one could just as well say that innovation by these firms is discouraged if they must pay royalties for using technology they invented on their own.

Furthermore, especially in the information technology sector, it can be very costly and difficult for a firm developing a new product to reliably identify all of the patents that might read on its product, much less to interpret the claims in those patents.[1] Literally tens of thousands of patents can read on a single product such as a smartphone or tablet. Given the large number of patents that might be asserted against a single product, the lack of clarity about the boundaries of those patents, and the probabilistic nature of patents, eliminating all acts of patent infringement is neither practical nor efficient.

II. Prospective Remedies Under Patent Law

The Patent Act (§284) states that patent damages shall be "adequate to compensate for the infringement." Put simply, compensatory damages are the basic patent remedy for prior infringement.[2] In situations where the patent holder competes against the infringing party, these damages typically come in the form of lost profits. In other cases, they come in the form of reasonable royalties.

Under the Supreme Court's *eBay* decision, if monetary payments are adequate to compensate the patent holder, then mandating

[1] See Federal Trade Commission (2011) and Lee and Melamed (2016). Clearing component inputs is especially problematic.

[2] See Cotter (2013). The analysis below does not address enhanced damages, which aim to deter "willful infringement."

those payments as ongoing royalties is the preferred prospective remedy and no permanent injunction will be issued.

Given the goal of compensating the patent holder, it might seem puzzling that ongoing infringement is *ever* allowed: by issuing an injunction, the court can insure that the patent holder is compensated for any future use of its patented technology, since the infringing firm cannot use that technology without the patent holder's consent. This argument is seductive but incomplete: an injunction can *over-reward* the patent holder by enabling the patentee to engage in patent holdup. Patent holdup can arise when designing around the patent is more costly after an infringement finding than it would have been when the product was initially developed.[3] The *ex post* design-around costs include any profits foregone while the infringer is forced to withdraw its product from the market until it can offer a version that does not infringe. Justice Kennedy's concurrence in the *eBay* case is explicit about this concern:

> "When the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for the infringement and an injunction may not serve the public interest." 547 U.S. 388 at 396-7

Patent holdup is addressed under *eBay* by balancing the hardships between the infringer and patent holder and in the public interest test.

Standard-essential patents provide an especially striking example of how a permanent injunction can over-reward the patent holder. Armed with an injunction, the owner of a patent that is essential to making Wi-Fi compliant devices could extract royalties vastly in excess of the royalties that the patent owner could have negotiated before its technology was included in the Wi-Fi standard.

The first two parts of the *eBay* four-part test ask whether the patent holder's harm from future infringement is "irreparable" and whether monetary payments are adequate to compensate for that harm. Irreparable harm and the inadequacy of monetary damages are difficult if not impossible to distinguish.[4] Economists may wonder why monetary payments are not *always* adequate to compensate for commercial harm.

Courts applying the first two parts of the *eBay* test ask whether they can identify and award ongoing royalties that will compensate the patent holder with reasonable accuracy. In cases where the patent holder and the infringer compete, the courts often find it difficult to determine how much the patent holder will be

[3] For extensive treatments of patent holdup, see Lemley and Shapiro (2007) and Cotter (2009).

[4] Cotter (2013) calls them functionally identical.

harmed by ongoing competition from the infringer. This is true even if the court has just awarded lost profits damages for prior infringement. This difficulty is understandable, since market conditions in the future may differ markedly from those in the past.

Seaman (2016) finds that 84% of requests for permanent injunctions were granted in cases where the patent holder and the infringer compete. The leading cause of irreparable harm found by the courts was loss of market share. In contrast, only 21% of such requests were granted in cases where the patent holder and the infringer were *not* competitors. The courts are likely to find monetary damages adequate in cases where the patent holder broadly licenses the patent in question or has previously offered to license that patent to the infringing firm.

Awarding ongoing royalties can be quite straightforward in cases where the the harm to the patent holder comes in the form of lost royalty income. In principle, the ongoing royalty rate should equal the reasonable royalty rate used to assess the damages from prior infringement. As pointed out by Lemley (2011), once reasonable royalties have been determined based on the hypothetical *ex ante* negotiation between the two parties, logically those royalties should apply equally well to future infringement as to prior infringement.[5]

III. Compensating the Patent Holder

The choice between an injunction and ongoing royalties is a choice between using a property rule and using a liability rule. There is an extensive literature comparing these two types of rules, going back to Calabresi and Melamed (1972). Kaplow and Shavell (1996) argue that a liability rule is superior for controlling harmful externalities but a property rule is better for "the taking of things."

Suppose downstream firm *D* has been found to infringe *P*'s patent. What happens next? If the two parties can then bargain efficiently, the Coase Theorem predicts that *D*'s ongoing use of the patented technology will be the same under either remedy regime. If the two parties do not bargain efficiently, the remedy regime affects what happens in the event of bargaining impasse. As a result, *D* is less likely to use the patented technology if an injunction is issued than if ongoing royalties are awarded. Therefore, much like the analysis in Kaplow and Shavell (1996), an injunction leads to higher *ex post* joint profits in situations where there are no gains from trade, but ongoing

[5] Nonetheless, the Federal Circuit has indicated that the ongoing royalty rate can exceed the reasonable royalty rate used for patent damages. See *Amado v. Microsoft* 517 F.3d 1353, 1362. Seaman (2015) finds that the median ratio of the ongoing royalty rate to the pre-judgment royalty rate was 1.34

royalties leads to higher *ex post* joint profits in situations with gains from trade.

But the central goal of the patent remedy system is to compensate the patent owner for any infringement, not to achieve *ex post* efficiency. Shapiro (2016) develops a model comparing injunctions vs. ongoing royalties based on how well they achieve this goal. He shows that injunctions are ideal in situations where the downstream firm has no switching costs, i.e., can design around the patent just as easily *ex post* as *ex ante*. However, if patent holdup is a factor, and if *P* and *D* do not compete, ongoing royalties tend to perform better in properly rewarding the patent holder.

The key factors that determine which remedy regime performs better are (1) whether there are *ex post* gains from trade; (2) the magnitude of any switching costs, and (3) the accuracy with which the court is able to measure the harm to the patent holder from future infringement. Ongoing royalties perform well if there are *ex post* gains from trade, which is the norm if *P* and *D* do not compete, and if the switching costs are large relative to the errors with which the court measures harm.

There is a nifty remedy that mixes a property rule with a liability rule: the court can award an injunction but *delay* that injunction to give the infringer time to design around the patent. The infringer pays ongoing royalties until the injunction takes effect. Lemley and Shapiro (2007) advocate this hybrid remedy, which has been used repeatedly by the courts since *eBay*.

IV. Impact on *Ex Ante* Licensing Terms

We now ask how injunctions vs. ongoing royalties affect *ex ante* licensing, i.e., licensing when the downstream firm is first developing its product. As noted above, very often such licensing is not feasible, due to the large number of patents and vague patent boundaries. The analysis here applies to situations where *ex ante* licensing is feasible and mutually beneficial.

Patent licensing always takes place in the shadow of litigation: if no license agreement is reached, the patent holder may sue the downstream firm for infringement. Therefore, the remedy regime that will apply if the patent holder wins in court influences the licensing negotiations. We now explain a fundamental reason why the ongoing royalties remedy is superior to the injunction remedy in terms of its impact on *ex ante* licensing negotiations. This analysis, based on Shapiro (2010), applies whenever (a) the outcome of patent litigation is uncertain, and (b) designing around the patent is less costly *ex ante* than it will be after the resolution of the patent litigation.

Consider the *ex ante* negotiation between the patent holder and the downstream firm.

Suppose the value to D of using the patented technology is V, P does not compete against D, and the gains from trade are V. Assume that whenever P and D bargain, they split the gains from trade equally, and that the patent remedy will be an injunction in situations where the infringer has no switching costs. If the patent were known to be valid, P and D would negotiate a royalty payment of $V/2$. In terms of patent law, the reasonable royalty for this ironclad patent is $V/2$.

In reality, however, patents are probabilistic: if a patent is litigated, the court may or may not find it to be valid and infringed.[6] Suppose there is a probability θ that P's patent will be judged valid and infringed by D's product. If this uncertainty could be resolved instantly, P would win with probability θ and then get $V/2$. If P and D are risk neutral, they would negotiate a royalty of $\theta V/2$. This provides a good benchmark payoff for the patent holder, who is entitled to the reasonable royalty of $V/2$ only if its patent is valid and infringed.

We now suppose, more realistically, that uncertainty about patent validity and infringement cannot be resolved instantly. This puts D in a bind. If D does not obtain a patent license right away, D has two ways to develop its product. First, D can design around the patent, giving up the value V of the patented technology. If this is D's threat point, D will end up paying a royalty of $V/2$, just as if the patent were valid for sure. Alternatively, D can forge ahead with product development, risking infringement liability. Suppose that taking this route would require D to incur switching costs of K in the event D later loses the infringement case and is forced to redesign its product to avoid infringing P's patent. What is D's expected royalty payment under this strategy? If P loses the patent litigation, D can use the patented technology free of charge. If P wins the patent litigation and gets an injunction, D will be in a weak negotiating position: D's willingness to pay for a patent license then will be $V + K$. Splitting those gains from trade means that D will pay a royalty of $(V + K)/2$. D's expected royalty is therefore $\theta(V + K)/2$.

In equilibrium, the *ex ante* royalty paid by the downstream firm equals the smaller of $V/2$ and $\theta(V + K)/2$. If the patent is relatively strong, $\theta > V/(V + K)$, then D's better threat point is to design around the patent. In this case, D pays $V/2$ rather than the benchmark amount of $\theta V/2$. The negotiated royalties are a multiple $1/\theta$ of the benchmark level. If the patent is relatively weak, $\theta < V/(V + K)$, then

[6] Lemley and Shapiro (2005) discuss the economic implications of the fact that patents are probabilistic.

D's better threat point is to forge ahead, risking exposure to patent holdup. In this case, *D* pays $\theta(V+K)/2$ rather than the benchmark amount of $\theta V/2$. The negotiated royalties are a multiple $(V+K)/V$ of the benchmark level.

This analysis tells us that *ex ante* licensing negotiations will result in royalties *higher* than the level of reasonable royalties if the court is expected to use an injunction remedy.

REFERENCES

Calabresi, Guido and A. Douglas Melamed (1972), "Property Rules, Liability Rules, and Inalienability: One View of the Cathedral," 85 *Harvard Law Review* 1089.

Cotropia, Christopher and Mark Lemley (2009), "Copying in Patent Law," 87 *North Carolina Law Review* 1421.

Cotter, Thomas (2009), "Patent Holdup, Patent Remedies, and Antitrust Responses," 34 *The Journal of Competition Law* 1151.

Cotter, Thomas (2013), *Comparative Patent Remedies*, Oxford University Press.

Federal Trade Commission, (2011), *The Evolving IP Marketplace: Aligning Patent Notice with Remedies and Competition*.

Kaplow, Louis and Steve Shavell (1996), "Property Rules Versus Liability Rules: An Economic Analysis," 109 *Harvard Law Review* 713.

Lee, William and A. Douglas Melamed (2016), "Breaking the Vicious Cycle of Patent Damages," 121 *Cornell Law Review* 385.

Lemley, Mark (2011), "The Ongoing Confusion Over Ongoing Royalties," 76 *Missouri Law Review* 695.

Lemley, Mark and Carl Shapiro (2005), "Probabilistic Patents," J*ournal of Economic Perspectives*, 19:75-98.

Lemley, Mark and Carl Shapiro (2007), "Patent Holdup and Royalty Stacking," 85 *Texas Law Review* 1991.

Seaman, Christopher (2015), "Ongoing Royalties in Patent Cases After *eBay*: An Empirical Analysis and Proposed Framework," 23 *Texas Intellectual Property Law Journal* 203.

Seaman, Christopher (2016), "Permanent Injunctions in Patent Litigation After *eBay*: An Empirical Study," *Iowa Law Review*.

Shapiro, Carl (2006), "Prior User Rights," *American Economic Review Papers & Proceedings*, 96:92-96.

Shapiro, Carl (2010), "Injunctions, Hold-Up, and Patent Royalties,' *American Law and Economics Review*, 12:280-318.

Shapiro, Carl (2016), "Property Rules vs. Liability Rules for Patent Infringement," at http://faculty.haas.berkeley.edu/shapiro.

Vermont, Samuel (2006), "Independent Invention as a Defense to Patent Infringement," 105 *Mich. Law Review* 475.